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Priorities and Production

The latest Government pronouncement on the subject of priorities is that the programmes included in the Prime Minister's original List will not in future enjoy automatic bulk priority for their supplies. It is intended henceforth to apply P.M.L. priority more specifically to selected items which cause trouble within the production programme. Certain iron castings are to enter this category. Our interpretation of this is—going from the general to the particular—where a quantity of machinery, say locomotives, is ready for export, except for name plates, then name plates must be accorded priority. We cannot help but think that the whole system of priorities has deteriorated from the high level which resulted from the method worked by Sir William Larke and his colleagues during the 1914 war. Then managements knew that until they had finally disposed of orders carrying this cachet, they could forget other items. After all priority work was finished, then, and then only, could they pursue non-priority work.

With the second war, there came into being much more bureaucracy, and with it compartmentalisation, resulting in decreased efficiency. For instance, a service department would demand new manufacturing facilities for a line of tank, aeroplane or gun production. For any of these there would be required large quantities of sheets, plates, bars, castings, machine tools, and the like. The urgency of these needs was impressed upon a number of officials who were charged to get supplies of the items listed. They all got busy and stocks of sheets, plates, bars, castings, and the like piled up and were stocked for perhaps a couple of years waiting for the arrival of the machine tools from the States. The action of each one of these officials was highly commendable, but the brake it placed on overall munition production was deplorable. The results can quite often be seen to-day in the availability of Government surplus stocks. Years ago for our living we used to put electric furnaces into commission. On arrival at, say, Decazeville, in the South of France, we requisitioned an office and a drawing board. On a large sheet of paper we listed all the jobs that had to be done; the name of the manager responsible, and his estimate of the time he required for doing the work. It was then easy to forecast the date of the first cast with a reasonable assurance that everything would be ready. Curiously enough the system worked, though experience taught us to bring forward the work of the pipe fitters, as this job invariably took longer than the estimate.

We never dubbed this simple system with the word "planning," but we did deem it to be foresight. To-day, we are afraid, that our simple system would be unworkable owing to priorities. At the moment they constitute a veritable barbed wire entanglement against the attacks of managements' foresight. In all sincerity we ask the Government to cut its priorities to the bone and leave industry to develop its business, especially the export trade, along natural lines, but within the framework of the policy they have postulated.

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The Joint Iron Council

As briefly announced in our last issue, Mr. Kenneth Marshall has been appointed Director of the Joint Iron Council. Mr. Marshall, a graduate of Cambridge University in Economics, after serving a works apprenticeship with United Steel Companies, Limited, remained with them in a technical and commercial capacity. Thereafter he joined Brown Bayleys Steelworks, Limited, in the Midlands where he remained till the outbreak of war. During the war he was at the Ministry of Supply in a technical capacity and served on various committees including the Technical Advisory Committee of the Iron and Steel Control and British Standards Committees. Mr. Marshall was called to the Bar in 1946. He vacates his position as chief of the Export Assistance Department at the National Union of Manufacturers to take up his new activities.

A Quarter Century Club

S. Russell & Sons, Limited, of Bath Lane Foundry, Leicester, have formed a Quarter Century Club for their employees. After an inaugural dinner at which no fewer than 54 persons were enrolled, a photograph was taken of eight members who had each completed a minimum of 45 years in the service of the company. The rules provide that each member on admission shall receive a present (from a list which includes gold wristlet watches, electric clocks, wireless apparatus, silver tea sets and the like), a certificate of service, and a small badge suitable for wearing in the button hole. We commend the formation of such clubs to other foundry concerns.

MR. T. MAKEMSON, M.B.E., Secretary of the Institute of British Foundrymen, has been elected Honorary Member of the *Association Technique de Fondcrie*.

THE INSTITUTION OF PRODUCTION ENGINEERS has appointed as Education Officer, Mr. T. B. Worth, until lately Head of the Production Engineering Section of the Birmingham Central Technical College. He will take up his duties on February 1, 1948. Mr. Worth has already made several valuable contributions to the advancement of the technical educational activities of the Institution, and in the furtherance of this important aspect of production engineering. It is hoped that all those concerned with the education and training of production engineers will avail themselves of his services. Mr. Worth, who is 38 years of age, was educated at the Wygeston Grammar School and the College of Technology and Commerce, Leicester. Mr. Worth has served on the Association of Principals of Technical Institutions—Association of Technical Institutes, Committee for the formulation of Schemes of Equipment for Workshops and Laboratories in Technical Colleges; with the Institution of Production Engineers as a Moderator; the Birmingham Section Committee, the Education Committee, and the Joint Examination Board of the Institution.

Forthcoming Events

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

FEBRUARY 9.

Institute of British Foundrymen.

Sheffield Branch :—"Fuel Economy in the Foundry," by Prof. R. J. Sarjant, at the Royal Victoria Hotel, Sheffield, at 7.30 p.m.

Institution of Production Engineers.

Southern Section :—Colour film and Lecture on "Die Casting," at the University College, Southampton, at 7.30 p.m.

FEBRUARY 10.

Institution of Works Managers.

Liverpool Branch :—"The Factories Act," by Miss E. Scholfield, H.M. Superintending Inspector of Factories. At the Exchange Hotel, Liverpool, at 6.45 p.m.

FEBRUARY 11.

The Association of Bronze and Brass Founders.

Midland Area :—Informal meeting of members at the Victoria Hotel, Wolverhampton, at 12.45 p.m.

Institute of British Foundrymen.

East Anglian Section :—"Foundry Conditions, Personnel, and Production," by R. F. Coates, at the Lecture Hall, Central Library, Ipswich, at 7.30 p.m.

FEBRUARY 12.

Institution of Production Engineers.

London Graduate Section :—"Sand Casting," by Mr. Challis, at the Waldorf Hotel, Aldwych, London, W.C.2, at 7 p.m.

The Institute of Metals.

London Local Section :—"Metallurgical Problems of Importance in Aircraft," by Dr. H. Sutton, F.I.M., at No. 4, Grosvenor Gardens, London, S.W.1, at 7 p.m.

FEBRUARY 13.

Institution of Chemical Engineers and The Physical Society, Low Temperature Group.

Joint Conference on "Developments in the Industrial Production and Use of Gaseous Oxygen," at the Institution of Civil Engineers, Great George Street, London, S.W.1, commencing at 10 a.m.

Institute of British Foundrymen.

Middlesbrough Branch :—"The Influence of Production Flow on Moulding Methods in Ironfoundries and its Effects on P.M.H. and General Efficiency," by R. C. Shepherd, at the Cleveland Scientific and Technical Institute, Middlesbrough, at 7 p.m.

FEBRUARY 14.

Institute of British Foundrymen.

Scottish Branch :—"The Constant Charge Method of Cupola Operation," by W. W. Braidwood, at the Royal Technical College, Glasgow, at 3 p.m.

Bristol and West of England Branch :—"Roller Conveyor and its Application to the Foundry," by J. Gardom, at the Grand Hotel, Broad Street, Bristol, at 3 p.m.

Newcastle Branch :—"Some Practical Aspects of Bronze Founding," by F. C. Evans, at the Neville Hall, Newcastle-upon-Tyne, at 6 p.m.

DR. SCHWARTZ, who received the E. J. Fox medal in 1939, is to give the Edward Williams Memorial Lecture at the Annual Conference of the Institute of British Foundrymen, to be held in London next June. Dr. Schwartz, who is the leading authority in the United States on malleable cast iron, hopes to be able personally to present his lecture.

The Metallurgist in the Foundry

Co-operation between technician and practical man

By W. H. Salmon, F.I.M., Assoc.Met.(Sheffield)

Introduction

The objects of this Paper are (*a*) to show how metallurgists are assisting foundrymen to produce better castings, and (*b*) to encourage young foundrymen to study the advances made in other branches of their art. For example, the steel foundryman can benefit by studying recent research in cast iron, copper base and even in light alloy founding. The work done on castings made in other foundry metals and alloys will often provide information leading to the solution of his own problem.

Castings are made in many metals and alloys, an overwhelming tonnage in cast iron, lesser proportions in steel and non-ferrous alloys. Table I shows the American annual output in 1943.

TABLE I.—*American Output of Castings.*

Grey iron	13,000,000 tons
Steel	2,000,000 ,,
Non-ferrous	2,000,000 ,,
Malleable	1,000,000 ,,

Cost Factors

The cost of the raw materials, the production difficulties and the quantities to be made are factors which affect the selling price of castings. In 1935 Prof. H. L. Campbell correlated prices for a simple casting without cores, made in various alloys. His figures, given in Table II, show that such a casting may cost four times as much in carbon steel as in grey iron and up to twenty times as much as cast iron when made in corrosion- or heat-resisting steels, depending on the alloy content. The wartime extensions in the production of aluminium and the huge stocks of scrap aluminium alloys now available has enabled the light alloy founders to reduce the prices of their castings to figures nearly as low as for grey-iron castings.

TABLE II.—*Commercial Prices of Castings, U.S.A.*, 1935.

200 off simple pattern, no cores.
Weight, 7 lb. iron, 2¼ lb. Al, 1¼ lb. Mg.

Material.	Price per casting. s.	d.
Cast iron	1	2
Malleable	1	9
Carbon steel	4	8
Stainless steel (18/8)	19	0
Heat-resisting steel (29/8)	22	0
Red brass	5	7
88.10.2 gun metal	6	4
Monel (69 Ni, 30 Cu)	29	0
92 Al, 8 copper	3	6
Magnesium alloy	7	0

Another factor governing the price of castings is the furnace temperature required to produce the molten metal. Iron castings can be poured from metal at a temperature of 1,250 to 1,400 deg. C., while steel castings are poured at temperatures from 1,450 to 1,700 deg. C. Better and more expensive refractories are used, and there is a greater consumption of fuel to attain the desired pouring temperature for the higher melting point alloys. Further, the amount of feeder head is much greater for steel than for iron castings.

"Foundability"

The most important requisite desired by the foundryman is clean, fluid metal which will fill the mould cavities at a sufficiently rapid rate to avoid the formation of cold laps, scabs and misrun castings. Fig. 1 summarises an excellent series of spiral fluidity tests made by Taylor, Rominsky & Briggs to demonstrate that composition as well as pouring temperature is an important factor in the foundability of steels used for

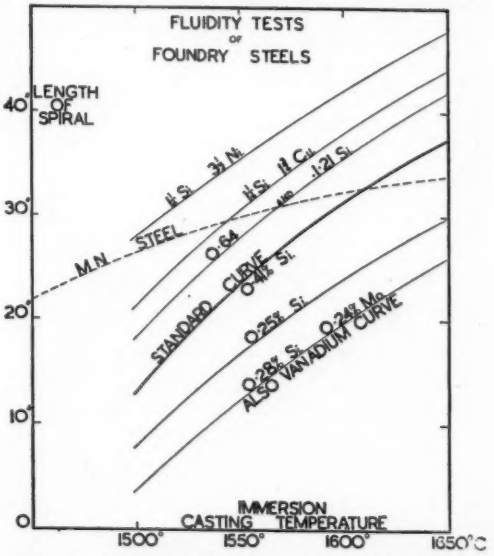


FIG. 1.—GRAPHICAL EXPRESSION OF THE RESULTS OF FLUIDITY TESTS.

* This lecture has been given before the Middlesbrough Branch, Lincoln Section (East Midlands Branch), and East Anglian Section (London Branch) of the Institute of British Foundrymen.

The Metallurgist in the Foundry

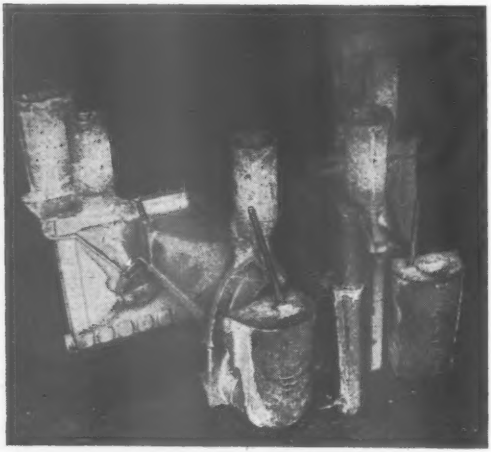


FIG. 2.—STEEL PIVOT BRACKET CASTINGS FOR HAWKER "TYPHOON" AIRCRAFT.

castings. Silicon, nickel and copper have a beneficial influence on the "foundability" of steels, but elements such as molybdenum, vanadium and titanium reduce the fluidity of steels of similar carbon content.

An interesting point which emerges is that Hadfields' 13 per cent. manganese steel is a very fluid steel at moderate temperatures and that increase in pouring temperature does not improve the fluidity to the same extent that it does for carbon steel. Furthermore, this means that manganese steel has a longer fluid life in the mould, and foundry experience shows that this is an excellent steel from the foundry point of view when care is taken to see that the moulds are collapsible, because manganese steel has a greater solid contraction than carbon steels.

The cast steel pivot brackets, shown in Fig. 2, for the undercarriage of the Hawker "Typhoon" fighter aircraft, are an interesting example of the importance of accurate pouring temperature control and the advantage of silicon and copper additions in simplifying the foundry production of thin-walled steel castings. The castings were bottom run, in pairs, and consisted of a vertical wall ¼ in. thick and a torque tube ¼ in. thick, with wings at each end in which there were quite heavy bosses. Each casting had to pass a Class I radiographic inspection, together with magnetic crack detection after heat-treatment. There was no difficulty in meeting the specified mechanical tests with simpler steels (carbon or manganese-molybdenum), but success was only achieved and castings produced free from internal shrinkage cavities, hot tears and surface cracks by close co-operation between the metallurgist and the foundryman. Table III shows the effect of higher pouring temperatures in reducing the percentage of defective castings.

TABLE III.—*Effect of Pouring Temperatures on Per Cent. Wasters.*

Foundry remarks.	Optical temperature (apparent °C.).	Per cent. waters.
Insufficiently fluid	1,450/1,500	26.7
Nicely fluid	1,515/1,575	10.0

Metallurgy in Iron Foundries

The ironfoundry metallurgist is fortunate that, in addition to silicon, he can use increasing amounts of phosphorus to gain this important property, "fluidity" or "foundability," when his foundry has to make extremely thin and long castings, such as rain-water pipes, gutters, and ornamental castings. However, he must use discretion in increasing the phosphorus content of his metal mixtures because the phosphide eutectic collects in increasing amounts around the grain boundaries and the castings with high phosphorus contents are very brittle. An interesting series of micrographs showing the effect of phosphorus contents from 0.10 to 1.20 per cent. on the network formation of phosphide eutectic was shown in the Proceedings of the Institute of British Foundrymen, Vol. XXIX, 1935-36.

The steelfoundry metallurgist cannot take advantage of this influence of phosphorus to promote "foundability" in his molten metal used for castings to be resistant to impacts, and it may be of interest to record that the phosphorus content of the steel used for the aircraft castings, shown in Fig. 2, was of the order of 0.01 per cent. On the other hand, the beneficial effect of phosphorus in running copper base alloys used for castings is well known.

The monumental work done by cast-iron metallurgists in controlling the size and form of the graphite constituent in iron castings is outside the scope of this Paper, but it is interesting to record that certain high-chromium content iron castings used for heat-resisting purposes must be cast from metal low in carbon, silicon and phosphorus. Castings such as needle and chisel point recuperator tubes with very thin sections and up to 8 ft. in length can be made successfully only when careful attention is paid by the metallurgist to supplying very hot metal, much hotter than can be provided by cupola melting. The melting furnaces employed are similar to those in use in alloy-steel foundries.

Casting Temperature

In no field of foundry practice is the necessity for accurate control of pouring temperatures more widely recognised than in the light alloy foundries. Each melting furnace has its own immersion pyrometer poised above the molten metal ready for a check test before the molten metal is considered satisfactory for the particular casting being made from that furnace. It is noteworthy that in the aluminium foundries, too, silicon has proved of great benefit in enabling their metal-

lurgists to provide an extremely fluid metal. Many of the most intricate light alloy designs can only be cast in an alloy of aluminium containing 12 per cent. of silicon, a much higher proportion than is used in the steel or iron foundries for conferring "foundability." However, the metallurgist had not finished his work when he had used 12 per cent. silicon, because it was found that it resulted in a coarse, brittle microstructure of the binary aluminium-silicon alloy. By means of a controlled addition of 0.015 per cent. of sodium during melting, the structure was "modified," and tough castings resulted.

Prevention of Gas Holes

As most foundry melting operations involve oxidation and reduction processes at high temperatures it is necessary to consider the influence of small amounts of deoxidising elements and variation in furnace technique to prevent the formation of internal gas holes in castings. The problem is more difficult for the metallurgist dealing with metal poured into sand moulds, than one whose molten metal is cooled more rapidly by being cast into metal moulds. Chill cast metal freezes so quickly that it is able to retain amounts of gas in solution that would cause serious unsoundness if the same molten metal were poured into sand moulds. Further, accurate control of deoxidation and degasification is more essential for steel castings made in green sand than in dry sand moulds.

Gas holes have been defined as spherical holes of varying size, fairly evenly distributed throughout the section of castings; larger holes tend to be found in the thicker sections because they are last to solidify. Usually gas holes have bright walls, but in the case of steels, the gas holes may be tinged with an oxide film. Gas holes are usually associated with castings having runners and risers showing risen or exuded top ("cauliflower heads") although in border line cases in steel, there may be no signs of definite rising, the upper surface of the riser may be flat without the more usual settling shown with fully degasified and deoxidised steel. Gas holes are due to metal which is out of condition and are not revealed until the surface of the casting has been removed by machining or grinding, or a section exposed by fracture or sawing. They can be distinguished from blow holes, caused by excessive moisture in the sand or improper venting, by the fact that they are more or less evenly distributed through the section and do not exist in localised patches. Examples of gas holes and pin holes in bronze and aluminium alloy castings have been illustrated in the "Atlas of Defects in Castings" published in 1946 by the Technical Council of the Institute of British Foundrymen.

Elimination of Hydrogen

The metallurgist takes care that the charge materials are free from moisture or oil, that tools and ladles are thoroughly dry and that the atmosphere of the melting furnace is of an oxidising character. A reducing atmosphere wastes fuel and contains excess hydrogen which is avidly absorbed by molten metals. Once hydrogen is absorbed by a molten metal it can be reduced to low, safe levels by using an oxidation treatment or by bubbling an inert gas through the melt to persuade the hydrogen to form bubbles, which can then rise harmlessly out of the bath. In steel making the charge usually contains more carbon, silicon and manganese than the finishing analysis and these elements are reduced or removed by an oxidation process, causing a violent boiling action which effectively removes any hydrogen which may have entered the melt. However, cases have occurred in the melting of heats of steel containing large proportions of alloy steel scrap, where hydrogen has been absorbed and led to the formation of gas holes. The cure was the same as that used in the melting of copper, namely, to melt under oxidising conditions and so reduce the hydrogen content to insignificant amounts.

Deoxidation

It follows that in every melting process for castings to be produced in any metal or alloy, it is necessary to remove the excess oxygen or oxide content of the molten metal before it is poured into the moulds. This object is achieved by adding an element or elements which have a higher affinity for oxygen than the molten metal. Any element which has a higher heat of oxide formation than that of the molten metal can be used, so long as the addition does not cause an explosion but forms a low-melting-point oxide of lower density than the liquid metal so that it will float to the surface to be removed with the slag. Table IV (after Sachs and Van Horn) shows a list of elements used for deoxidation, placed in order of decreasing affinity for oxygen. Elements towards the top of the table will deoxidise molten metals which occupy a lower position in the table.

Commencing from the bottom of the table it will be seen that copper and copper alloys can be deoxidised with tin, phosphorus and zinc, etc. The higher the position of the deoxidant in the table, the more potent is its action, so quite small amounts of calcium, lithium and calcium boride will deoxidise molten copper satisfactorily. Molten steel (an iron alloy) is deoxidised with manganese, silicon, titanium, vanadium and aluminium, and with combinations of deoxidants such as calcium-silicide, and calcium-silicon-manganese.

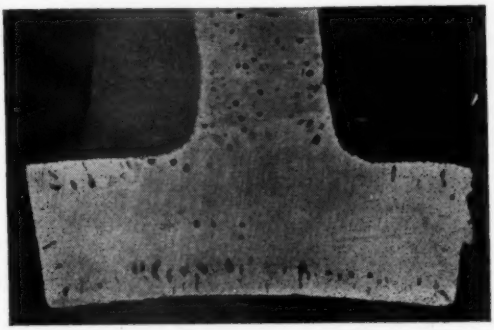


FIG. 3.—SECTION THROUGH A FAN BLADE CASTING.

The Metallurgist in the Foundry

Molten cast iron already contains considerable proportions of carbon, silicon and manganese and seldom needs deoxidising. Nickel and nickel alloys are deoxidised with manganese, silicon and magnesium. As aluminium occupies a very high position in the table, great care must be used to avoid over-oxidation in melting because there are very few elements available which will deoxidise it. Magnesium, still higher in the table, is the most difficult metal to cast, extraordinary precautions must be taken to avoid oxidation not only in melting, but even in the casting operations; the molten magnesium is dusted with a covering of sulphur to provide an atmosphere which protects the flowing metal from oxidation.

As none of these deoxidants is 100 per cent. efficient, an amount considerably in excess of the quantity calculated to combine with the existing oxygen must be added, and therefore the presence of excess deoxidant in the metal must have no deleterious effect on the physical properties of the castings (or the electrical properties in the case of copper). Moreover, after deoxidation has been carried out in the furnace, care must be taken to see that the molten metal is not heated to such a high temperature as would cause the metal to become re-oxidised, or render the amount of deoxidiser insufficient to be effective at the higher temperature.

TABLE IV.—*Deoxidation of Molten Metals (Sachs and Van Horn).*

Element.	Melting point, deg.C.	Density at 20 °C., gm./cm³.	Density of Oxide, gm./cm³.	Heat of formation of the oxide, kilo cal./ gm. atom 0.
Calcium	850	1.55	3.4	152
Magnesium ..	650	1.74	3.6	144
Lithium	330	0.53	2.0	141
Aluminium ..	660	2.70	3.5	127
Vanadium	1,710	5.68	4.9	116
Titanium	1,800	4.50	4.3	109
Sodium	97	0.97	2.3	101
Silicon	1,430	2.40	2.3	95
Manganese	1,240	7.44	5.5	91
Zinc	420	7.14	5.5	85
Phosphorus ..	40	1.82	2.4	73
Tin	240	7.30	6.95	68
Iron	1,540	7.87	5.7	66
Nickel	1,450	8.90	7.45	58
Copper	1,080	8.94	6.0	40

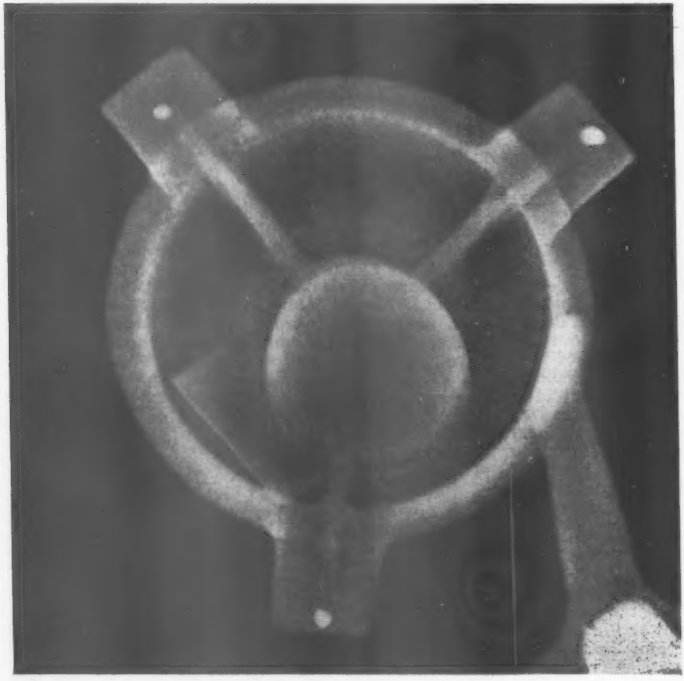


FIG. 4.—X-RAY PHOTOGRAPH OF CAP CASTING SHOWING DEFECTS IN THE DOMED-SHAPE PORTION.

An example of the effect of inadvertently reheating after deoxidation is shown in Fig. 3, a sawn section of a fan blade casting made in a low carbon-molybdenum steel melted in a high-frequency induction furnace. Three separate shanks (small ladles) of steel were taken from a 2 cwt. furnace. The castings from the first shank were satisfactory, those castings poured from the second shank showed slight signs of rising, and the castings from the last shank rose in the risers and the sawn section of one of the castings (Fig. 3) showed that the gas holes were subcutaneous and would not be revealed until the surface had been machined.

Figs. 4 and 5 are X-ray photographs of cap castings made in mild steel and illustrate two types of defect that can occur in a steel casting by variation in the deoxidation practice. Fig. 4 shows gasholes in the dome-shaped portion, visible as darker specks on the grey background. Fig. 5 shows that a further addition of deoxidant has cured the gashole trouble, but because more fully deoxidised steel shrinks to a greater extent, there are shrinkage defects in the three square lugs

around the periphery of the casting. These shrinkage defects were overcome by the use of local chills by the moulder, but it is interesting to record that variations in the properties of the molten metal can cause two different types of defect in a small steel casting.

Amount of Deoxidant Required

The determination of the exact amount of deoxidant to employ is not always easy, an excess is always used for safety. Every heat of steel is tested for this tendency to rise by pouring a sample into a green sand mould made by pressing a tapered stick into the sand actually in use in the foundry. The upper surface of the molten steel is watched as it is freezing, and if signs of rising appear, further deoxidant (usually aluminium) is added to the furnace or ladle. One method of finding the exact amount of final deoxidant is illustrated in Figs. 6 and 7. Sets of four test castings, consisting of hollow, tapered cylinders 2 in. inside diameter × 3 in. tapering to 4½ in. outside diameter × 9 in. long were cast from a number of heats of steel. The cylinders were cast horizontally in green sand without risers, and after cooling ¼ in. was machined from the outside surfaces to reveal the presence of gas holes. The section of the castings tapered from ¼ in. to 1¼ in., and thus gave an indication of the quality of the steel when cast into varying sections common in such green-sand castings. After a settling test had been made by the furnaceman, the four cylinders were poured from separate shanks to which had been added increasing amounts of aluminium, namely, 0.03, 0.06, 0.11 and 0.17 per cent.

The cylinders numbered 23, 24, 25 and 26 (Fig. 6) were cast from steel which was slightly inclined to rise in the green-sand furnace test, and which was settled with 0.014 per cent. of aluminium. Examination of the castings showed no gasholes visible on the surface. Machining revealed no gasholes in the thinner portion of No. 23 casting (0.03 per cent. Al), but many bad gasholes in the thicker section. No. 24 casting, to which had been added 0.06 per cent. of aluminium, showed a few gas holes in the thick sections. Castings numbered 25 and 26 (0.11 and 0.17 per cent. aluminium respectively) showed no gasholes..

The second set of four test castings, Nos. 31/34 (Fig. 7), were made from steel which was definitely inclined to rise in the green-sand furnace test and which needed 0.03 per cent. of aluminium to make it settle. Machining of cylinder number 31 (0.03 per cent. aluminium) showed very bad gasholes in the sections from ¼ in. to 1¼ in.; cylinder number 32 (0.06 per cent. aluminium) showed no gasholes in the thin sections but bad gasholes in the thicker sections. Cylinder No. 33 (0.11 per cent. aluminium) showed a few scattered and small gasholes in the thicker sections, and casting number 34 (0.17 per cent. aluminium) was quite free from gasholes.

In this manner it was possible to devise a steel making schedule of the correct amount of deoxidant to use to prevent the formation of gas holes in green sand castings, up to 1¼ in. thick. It will be noticed that the amount was more than the percentage addition which gave a settling test on the furnace stage. It is only by close co-operation between the metallurgist and the foundrymen that sound green sand castings are produced in low carbon steels.

Surface Appearance

The importance of fluidity or "foundability," conferred by raising the pouring temperature and by

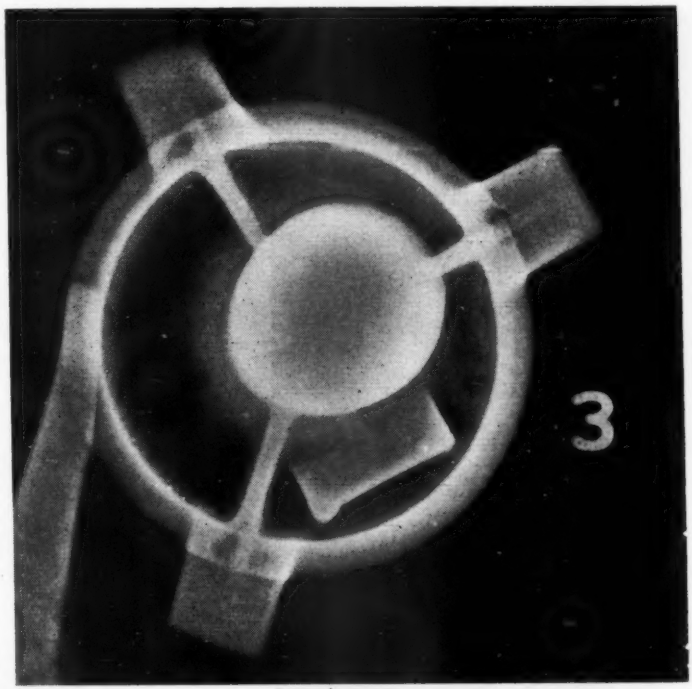


FIG. 5.—X-RAY PHOTOGRAPH OF CASTING SHOWING DEFECTS IN THE PERIPHERAL LUGS.

The Metallurgist in the Foundry

adding certain elements, in producing castings free from surface blemishes such as cold laps and misruns has been referred to previously. Metallurgists have also given great assistance by co-operating with foundrymen to improve the surface appearance of their castings by means of sand control and by special additions to the moulding sands, mould facings and dressings for different types of metal. The use of coal dust in cast iron foundries to provide a gas film to give beautifully smooth blue-coloured castings; the introduction of inhibitors in magnesium foundry sands to prevent a reaction between the moisture in the sand and the molten metal; the addition of silica flour, chamotte powder or iron oxide powder to reduce burning-on and prevent penetration of molten steel into sands used for heavy castings; and the provision of an inert atmosphere in moulds to protect the sand used in casting high melting point alloys—these are all examples of the benefits gained by metallurgists and moulders working together for the common cause, the production of better-looking castings.

Late Addition of Aluminium

Important researches on those points continue, but Figs. 8 to 11 illustrate the results of a different method of approaching the problem and one which produced

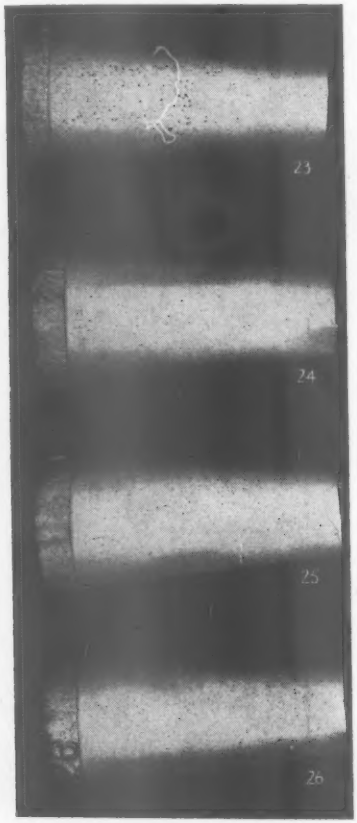


FIG. 6.—DEOXIDATION TEST CASTINGS AFTER MACHINING—ORIGINAL METAL SLIGHTLY OXIDISED.

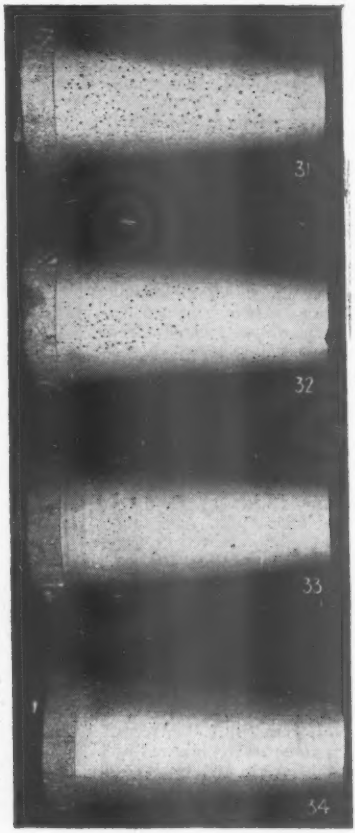


FIG. 7.—DEOXIDATION TEST CASTINGS AFTER MACHINING—ORIGINAL METAL BADLY OXIDISED.

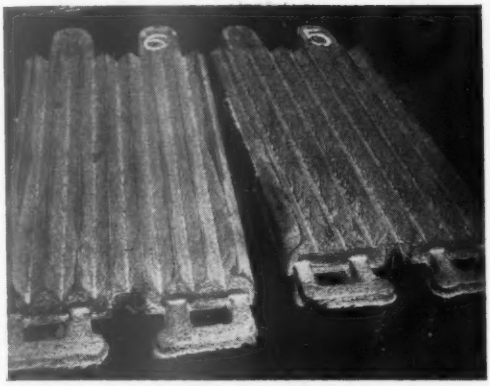


FIG. 8.—CRUSHER JAWS CAST IN GREEN-SAND MOULDS. No. 5, WITHOUT ADDITION; No. 6, WITH A LATE ALUMINIUM ADDITION OF 0.03 PER CENT.

considerable economies in the production of large crusher jaw castings in Hadfields 12½ per cent. manganese steel. These castings are 31 in. long × 19¾ in. wide × 3¼ in. thick, and weigh 5 cwts. each. While light section crusher jaws of smaller size can be made satisfactorily in green sand or dry sand, great difficulty was experienced with these heavier, solid-back jaws which had 1½ in. thickness of metal at the root of the teeth. The bottom part of the mould consists of a number of ridges of sand, and it is well known that sharp points of sand become overheated and can produce disturbance in the molten metal flowing around and above them. An additional factor in this case is that Hadfield's 12½ per cent. manganese steel has a very severe action on silica sand, forming a layer of manganese-silicate slag—a fact which often simplifies fettling, but this slag formation must be controlled.

Fig. 8 shows two crusher jaws which were poured in green sand, No. 5, at a temperature of 1,330 deg. C. (apparent-optical) without any addition to the molten steel, and No. 6 cast at 1,340 deg. C. (optical) to which 0.03 per cent. of aluminium was added to the steel as it was flowing from the ladle into the mould. The surface appearance of No. 5 casting was very bad, the severe scouring action along the ridges of sand causing the roughness shown in the photograph, and there were also a large number of holes in the roots of the teeth. The surface appearance of No. 6 was rather better than No. 5, but was not considered good enough for production.

Fig. 9 shows two further crusher jaws, both poured at 1,345 deg. C. (optical) from the same heat of steel as Nos. 5 and 6. No. 7 casting had an addition of 0.08 per cent. of aluminium, and No. 8 casting an addition of 0.17 per cent. of aluminium while the steel was flowing into the green sand moulds. No. 7 is a good jaw with a smooth surface and practically no signs of the scouring action down the sides of the teeth. No. 8 casting also has a smooth appearance, and it is noteworthy that the teeth of these jaws in green sand were sharper than the next set cast for comparison in dry sand (painted with magnesite paint) and illustrated in Figs. 10 and 11.

The dry sand jaw casting No. 1 (Fig. 10) has a very bad appearance; there is not the severe wash in the sides of the teeth shown in the green sand casting, but there are a large number of deep holes in the roots and sides of the teeth. No aluminium was added to the manganese steel as it was flowing into the mould. An amount of aluminium, equivalent to 0.03 per cent., added to the steel for No. 2 casting, caused a considerable improvement in surface appearance, for this jaw was quite smooth along the root and sides of the teeth. There were a few minor surface depressions in the roots of the teeth but no deep-seated holes.

Fig. 11 shows the appearance of two further jaw castings made from the same heat; No. 3 casting was treated with 0.08 per cent. of aluminium, and No. 4 casting with 0.17 per cent. of aluminium. Both castings had excellent surfaces, smooth and free from imperfections at the root of the teeth.

Other experiments carried out showed that the use of aluminium powder dusted on the green sand mould faces, or aluminium paint on dry sand moulds, were ineffective. Moreover, the amount of aluminium found effective when made as a very late addition to the manganese steel as it was flowing into the mould, was quite ineffective when added to the steel in the furnace or ladle five or six minutes before pouring commenced. Time is an important factor in making such additions to improve the surface appearances of these castings.

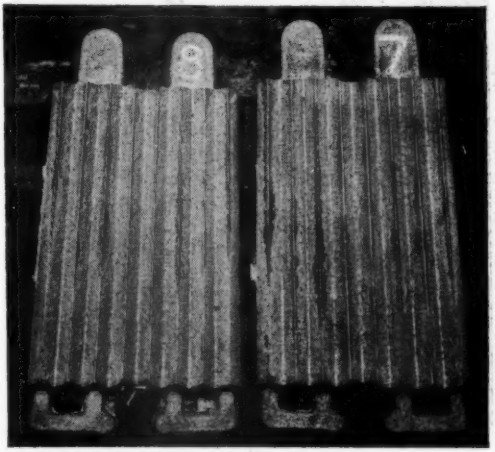


FIG. 9.—CRUSHER JAWS CAST IN GREEN-SAND MOULDS. No. 7, WITH 0.08 PER CENT. ALUMINIUM; No. 8, WITH 0.17 PER CENT. ALUMINIUM.

The Metallurgist in the Foundry

Hot Tears

While the tendency for a casting to exhibit hot tears and cracks is very closely related to the design of the casting and the extent to which the moulder has taken precaution to prevent the development of high stresses in the casting as it is cooling in the mould immediately after solidification, minor variations in chemical composition can influence the production of hot tears in critical designs. Naturally, hot tears are more prevalent in metals and alloys which have a high "pattern-makers" contraction, so that more defects of this nature are encountered in steel than in grey cast iron. It is known that the purer the metal the less it is prone to hot tears in a mould and the influence of sulphur content on the hot tearing of complicated branch piece castings made for the Steel Castings Research Committee of the Iron and Steel Institute is shown in Table V.

TABLE V.—*Influence of Sulphur Content on the Cracking of Branch-piece Steel Castings.*

	Basic electric steel, per cent. sulphur.	Acid open-hearth steel per cent. sulphur.
No cracks	0.002 to 0.008	0.024
Slight cracks	0.015 to 0.028	0.024
Serious cracks	0.020 to 0.028	0.033

It is interesting to note the difference between the results with basic electric and acid open-hearth steel, which suggests that the sulphur content is not the only factor involved, and may point the reason why steel foundrymen prefer acid steel for certain types of castings.

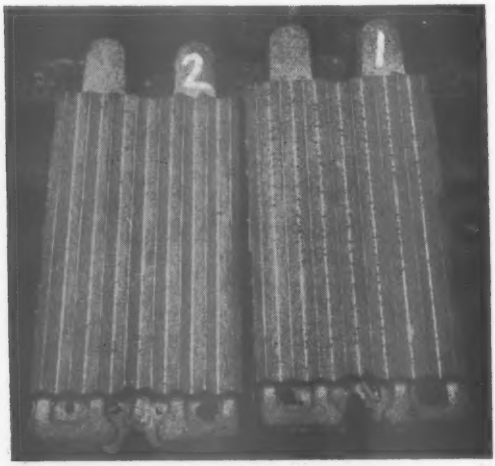


FIG. 10.—CRUSHER JAWS CAST IN DRY-SAND MOULDS. NO. 1, WITHOUT ADDITION; NO. 2, WITH 0.03 PER CENT. ALUMINIUM.

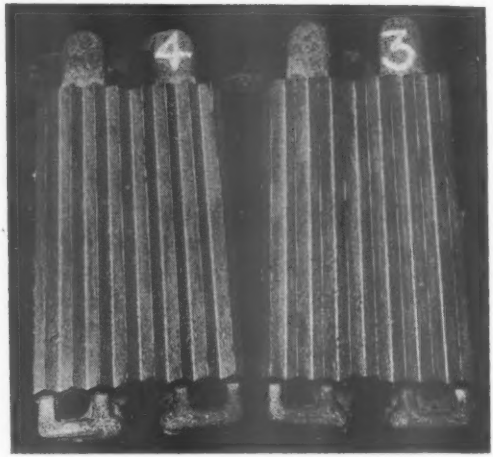


FIG. 11.—CRUSHER JAWS CAST IN DRY-SAND MOULDS. NO. 3, WITH 0.08 PER CENT. ALUMINIUM; NO. 4, WITH 0.17 PER CENT. ALUMINIUM.

Sir Andrew McCance, in the Iron and Steel Institute Symposium on Steel in 1938, gave the information shown in Table VI, which illustrates that at the rolling temperature of steel ingots (a lower temperature than that at which hot tears develop in steel castings) the effect of increasing sulphur is to increase the percentage of ingots which crack or tear during the hot-rolling operation.

TABLE VI.—*Influence of Sulphur on the Liability to Rolling Cracks.*

Per cent ingots showing rolling cracks.	Per cent sulphur.
Nil	0.015
1	0.020
42	0.030
65	0.040
75	0.050

In the case of Hadfields' 12½ per cent. manganese steel sulphur contents within the limits normally present do not appear to have much influence on the tendency to hot-tear formation, but phosphorus contents higher than normal have a very bad influence in reducing the hot strength of this steel at temperatures just below the solidification temperature. Therefore, for difficult designs and for lengthy castings, it is necessary to keep the phosphorus content below about 0.100 per cent. Table VII shows the results of hot tensile tests carried out at 1,150 deg. C. by the American Manganese Steel Company on 12½ per cent. manganese steel; the rapid fall in tensile strength above 0.100 per cent. phosphorus is noteworthy.

(*Concluded on page* 132.)

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

TESTING METALLIC ABRASIVES

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Dr. Hurst, in his most interesting Paper "Methods of Testing Metallic Abrasives," admits that that the final test of the quality of metallic abrasives lies in their actual behaviour in service, but adds that service tests take a long time, are not easy to carry out, and that there is difficulty in obtaining conclusive results.

The qualities which a user would probably wish to have specified for chilled iron grit for the conditions in which his plant will operate are:—(1) Cutting capacity; (2) life, and (3) grading.

In my view, a short test with simple apparatus will give the information required under headings (1) and (2).

The apparatus (sketched in Fig. 1) would consist of a small cabinet fitted with a nipple A at the base of an inverted conical hopper to regulate the flow of abrasive into the induction pipe B, which would lead to the suction system nozzle assembly C, to which pressure air would be supplied through valve D and reducing valve E.

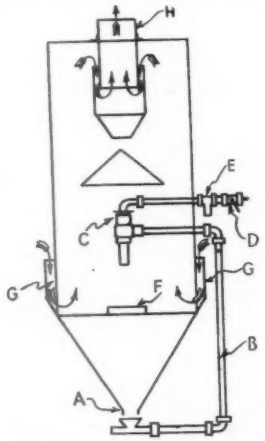


FIG. 1.—APPARATUS FOR DETERMINING SERVICE BEHAVIOUR OF METALLIC ABRASIVE SHOT OR GRIT.

The abrasive would be discharged on to a weighed test-piece F placed at a fixed distance from the tip of the nozzle, and perpendicular to its axis.

The cabinet would have properly baffled air inlets G and outlet H, the latter being connected to a constant speed fan, discharging to atmosphere. (It would probably be inadvisable to use a filter, since over a period the screen resistance would change, and alter the rate of dust suction air flow.)

For the test, one pound of abrasive would be used, and circulated continuously from the hopper, through nipple A and nozzle C, on to test-piece F, and back to the hopper, the dust generated by breakdown being continuously removed by the fan suction.

Taking roughly approximate figures, the abrasive would be circulated thirty times in a five-minute test; the equivalent of a day's run in normal working conditions. The loss of weight of the test-piece would be a measure of the cutting efficiency; and the weight of abrasive left in the hopper expressed as a percentage of one pound, a measure of life.

Test-pieces could be used of material which would be cleaned under working conditions, but probably for specification purposes three grades of steel of defined hardness would suffice to give all the information likely to be required.

To obtain information to cover various working conditions, tests would be made at a number of pressures, say 50, 100, 150 and 200 lbs. per sq. in.

These pressures are high because the velocity of discharge of abrasive from a suction-type nozzle is very much less than that from a pressure system nozzle operating with air at the same pressure. Initially, it would be necessary to correlate velocities obtained using the suction system, with those obtained using the pressure system and the mechanical thrower system, and this could be done without much difficulty.

The quality of an abrasive might then be fully specified so far as headings (1) and (2) are concerned in terms as follows:—

Standard Test.

Air pressure, lb. per sq. in.	Test piece.	Cutting efficiency factor.	Life factor.
50	A		
	B		
	C		
100	A		
	B		
	C		
150	A		
	B		
	C		
200	A		
	B		
	C		

Twelve tests would give all the information required—a morning's work. It would, of course, still be necessary for the manufacturer to relate these service tests with his production methods and metallurgical tests, and for some uses one or more of these might be most important—as, for instance, hardness, when the shot is to be used for peening. For research purposes additional useful information could be obtained by sieving used material, and testing for different periods of blasting.

Testing Metallic Abrasives

On the third factor—grading—the practice at present is to use sieves, and it is of interest to note the effect of wire wear on grading. If sieves to I.M.M. standards be used, the apertures are increased by 50 per cent. when the wires are half worn, *i.e.*, the mesh is about four sizes larger. Doubtless, in practice, corrections are made for wear, but it is doubtful if wear will be uniform, and certain that commercial gradings do vary considerably. But the quality of the surface treated by blasting depends on the nature, weight and velocity of the particles used; and weight and shape both affect velocity. If particles covered by a single grade are in some cases halves of small shot, and in others smaller fractions of larger shot, there will be very considerable variation in shape of cutting edge, weight, hardness and velocity, even though working conditions are apparently constant. Perhaps Dr. Hurst can say whether it is the practice to grade shot before crushing and then to grade the grit; or only to grade the grit after crushing shot of many sizes.

It would be interesting to know if grading has been attempted by carrying the abrasive in an air stream flowing through a pipe of increasing cross-section, so that particles fall out of suspension as the air velocity becomes inadequate to convey them; and, if so, with what success.

I hope, sir, that as a result of Dr. Hurst's work, metallic abrasives will be much improved in quality, with consequent economy in use.—Yours, etc.,

F. W. NEVILLE,
J. W. Jackman & Company, Limited.
Blackfriars Road,
Manchester, 3.
January 26.

A New Research Project

The steel division research committee of the American Foundrymen's Association will sponsor a study of the influence of mould conditions on the development of hot tears in steel castings. Confined to an investigation of factors within the mould itself, the research under exacting laboratory conditions is expected to determine which factors contribute to the development of the defect and to what extent, and to indicate suitable methods for the control of hot-tearing in production operations. Also involved in the project is the design of a pattern to serve as a measure of the tear susceptibility of various steels. Mr. Clyde Wyman, metallurgist for Burnside Steel Foundry Company, Chicago, heads the research group which will direct the study.

Among mould factors to be studied in the new A.F.A. project are mould collapsibility, sand grain size, moisture content, hot strength, mould hardness, and binder content. The relationship of each to the occurrence of hot tears will be established. A standard melting procedure and rigid control techniques will be used to obtain metal of uniform analysis and pouring temperature for all tests.

Oilfield Equipment Castings

An Expanding British Industry

Before the war oilfield engineering supplies were almost exclusively dominated by America, who had long experience in manufacture and found close at hand facilities for testing new equipment and new techniques; and the market was worth only a few hundred thousand pounds annually to British suppliers. Two years ago, however, British engineers made a concerted attempt to capture at least the market offered by the British oilfield companies, with such success that last year oilwell equipment valued at no less than £47,000,000 was delivered to British oilfields, a feat that not only conserved foreign exchange resources to that extent but by augmenting American sources of supply—strained by the first part of the U.S.A. two-year programme involving the expenditure of over four thousand million dollars—made a contribution towards solving the world problem of maintaining adequate supplies of oil at a time of universal coal shortage.

Many types of equipment now known to be well within United Kingdom capacity are not yet made here, but the gap is closing; manufacturers have the close support of the British oil companies, and forecasts are that orders for equipment this year may total £71,000,000.

The further outlook ties up with the estimate that by 1951 the Near East and Persian Gulf producing areas will be exporting more oil than the whole of Latin America, and that more processing of oil will be done in the U.K (to quote one extension, a new refinery at North Shields, to cost £2,000,000, has just been authorised, being part of an immediate expenditure of £14,000,000 on such works), in addition to which it would seem that the rehabilitation of Near Eastern and Far Eastern oilfields will cost as much as £100,000,000.

Co-operation of manufacturers, to which the remarkable success of this new branch of British engineering is to a large extent due, is so complete that work is already going on with the oil companies in connection with standardisation under the ægis of the British Standards Institution, which will obviate innumerable supply difficulties.

The above information was disclosed at a Press Conference held at the Penistone foundry of The David Brown Foundries Company, where much of the pioneer work was done and where oilwell engineering has been credited with the importance it merits as a major concern of modern British foundry practice.

MR. HUGO E. JOHNSON, formerly research associate with the Carnegie-Illinois Steel Corporation, has been appointed to the administrative staff of Battelle Institute, Columbus, Ohio. Mr. Johnson will co-ordinate the interests of the various research groups at Battelle concerned with the metallurgy of iron and steel and will act in a liaison capacity between the Institute and the iron and steel industries.

Overseas Foundry Conditions

Report from the Newcastle-upon-Tyne branch of the I.B.F.

The Newcastle Branch held its monthly meeting on Saturday January 10, in the Neville Hall, when it was honoured by visits from the President of the Institute, Mr. Percy H. Wilson, O.B.E., and the Secretary, Mr. T. Makemson, M.B.E.

After voicing the sentiments of the meeting in wishing the speedy return of their secretary, Mr. C. Lashly, the President welcomed the visitors, and called upon Mr. Wilson to address the meeting.

MR. WILSON reviewed the past history of the Branch, pointed out the many advantages that accrued from membership, which he was pleased to note was increasing, and asked members to recruit new adherents individually. He remarked on the large proportion of Associate Members and Associates compared to Members: this position should be investigated. Increased membership would enable the Institute to do more good work through its various committees.

MR. MAKEMSON, who followed, emphasised the fact that the policy of the Institute was not dictated from the top, but that it was truly democratic in its constitution and actions, these being based upon the opinions and recommendations of the Branches. The Branch was the unit through which each member could exercise his influence to the advancement of the Institute as a whole. He was pleased to say that the Institute was flourishing, and, apart from what might be termed their domestic internal interests, they were attaining a wider recognition and participation as a national organisation.

This was Past-Presidents' Night, and the Branch-President then asked Mr. T. B. Burrows to give his address relating to Indian Foundries.

Conditions in Foundries in India

MR. BURROWS said his experience covered a variety of foundries in Calcutta, Bengal and Bihar. Generally speaking, their layout, equipment and procedure closely approximated to British practice with certain modifications due to the climatic conditions. Buildings were loftier and more spacious, and with northern lighting and side sheeting only down so far as to leave free circulation of air. They were all large foundries that came under his purview, and most of them establishments that took on everything from items weighing a few ounces up to 25 tons. Tackle and plant were similar to those in Britain. Here he paid a tribute to the management by British foundrymen in India in the past.

Raw Materials

Owing to the ravages of white ants and other pests, patterns were of teak; no yellow pine was used as with us. One very large foundry had excellent sand *in situ* and, in addition, was in the centre of a coalfield. Indian coal was not a good coking coal; it had a high ash content, averaging 15-20 per cent. On this account a high proportion of coke had to be used in the cupolas, thus restricting output. It has to be remembered, however, that distances in India are great and foundries are compelled to be self-contained, as far as possible, in the way of fuel, sand, and primary materials.

Gas-fired mould-drying and core stoves had a plentiful supply of gas produced on the plant. He saw some large moulds being dried by coal fires.

Indian Labour

Turning to the labour side, he was astonished to see so much of the heavy labouring work done by women, and young ones at that. A slip of a girl could carry with ease on her head a burden which required two men to place it there.

The finish on the work compared favourably with what obtained in this country; in fact, the Indian workman was likely to run to extremes in this respect. The absence of small tools was remarkable; he never saw a trowel; pieces of wood seemed to serve all purposes. Another surprise to him was to see men working in their bare feet even when tapping or pouring metal.

The majority of craftsmen took a pride in their work and often followed their jobs through to the finishing stage to see the result of their labour. Language was not the difficulty that might be expected, owing to their long acquaintance with terms used by English superintendents. A point of importance was that, once a man had been taught to do a job in a certain way, it was extremely difficult to get him to change his procedure.

Time, work, piece-work and bonus incentives were in operation. Hospital and dispensary services, accident prevention and other committees were run on similar lines to ours.

Answering questions, he said the caste system caused little trouble, though to some extent care had to be taken in certain classes of work to segregate castes. The output of castings was entirely for the Indian market.

It would be unfair to attempt to make a comparison between the wages paid in Indian foundries and our own, the standards of living being so different. Trades unions functioned for every branch. An apprenticeship system was now in operation, particularly for staff posts.

American Conditions

MR. WILLIAM SCOTT, O.B.E., J.P., addressed the meeting, giving some observations on American foundry practice as he saw it when in the States. Although the purpose of his visit was of another nature, he was able to go through a number of foundries, particularly those of a type producing castings similar to those made on the North-East Coast. He did not think the Americans could teach us much in the production of heavy castings for marine and locomotive engines, or hydraulic

work, in iron or steel. None of their methods could be adopted by us with advantage. He saw them, for instance, casting marine engine bedplates and placing heavy weights on the top to keep the box down; that is what we used to do 20 years ago, but we have since discarded the practice.

Use of Moulding Machinery

Moulding machines, he noticed, were working all the time. It was a reflection on our managements in this country that sufficient attention was not given to ensure that the services incidental to running these machines to their full working possibilities were not available. The same thing applied to Sandslingers. In an American foundry it was the demands of the men for the services of the Sandslinger that brought it into full use, and not those of the foreman.

He found workmen were greatly interested in numbers and tonnages, not only regarding their individual production, but also that of the shop or department.

Methods of Working

Eight hours a day, five days a week, were worked, but they were 40 hours of *work*, as only a few minutes were taken for a snack on the job. In spite of the high wages, a moulder receiving about $2.1 per hour, the Americans are able to compete successfully against Britain, Belgium and India, proving again that a high rate of production is the solution to many of our difficulties.

In several regions of the U.S.A. foundries have an advantage in possessing ample supplies of natural gas and heavy residual oils. He had even seen open-hearth furnaces running on these fuels with excellent results. They had greater control of fluidity than we had here. An innovation he observed in one plant was the installation of a vacuum tube from the charging platform of the furnaces to the laboratory staff, who were thus able to report back their analysis figures in less than 20 min. American workmen were more prone than ours to use goggles and other protective measures at their work. Mr. Scott punctuated his address with one or two pithy stories.

MR. WILSON said there was no doubt that in the U.S.A. the output per man was double, or even treble, than with us, but it must not be assumed that this meant any extra effort on the part of the workman; it was a question of systematising operations. In the case of the moulder, there was often 20 per cent. or more of his work that could be done by a labourer. The ideal was for the skilled man to devote 100 per cent. of his time to skilled work.

MR. MAKEMSON said his views coincided in general with those of Mr. Scott. The American employer gave the workman the tools and services, and machines were used wherever possible. Generally, they had the production bias, whereas we in this country tended to bear the craftsman bias.

After a pleasant and instructive meeting, a cordial vote of thanks was accorded the visitors and speakers.

Core Frames or Boxes

By "Tramp"

Cores can be produced in a number of ways, and the pattern maker should be conversant with the advantages and limitations of the various methods. For example, core frames and strickles can often be employed quite successfully for large pipecores, and in fact this method possesses a number of advantages over the employment of a heavy cumbersome core box. On the other hand, cores containing a number of brackets, bosses, etc., are best made in a suitable core box.

A particularly bad example of the wrong type of core-making equipment recently came to the notice of the writer. Supplied by a master pattern shop, this equipment was for the manufacture of the interior portion of a heavy and complicated pump casting and consisted of a board to which semicircular ends were secured. Various bosses, stiffening ribs, etc., were to be introduced into the core during building, but their location was not positive. The removal of the core from the frame presented another difficulty. Unlike normal core frames which permitted the core to be made on a core plate and left *in situ* for drying, in this case the equipment had to be removed by another method. The core, after ramming, had to be rolled over to allow the removal of the woodwork. As the order concerned twelve castings the time wasted in using the equipment provided was more expensive than would have been the production of a suitable box in which the core could easily be rammed and from which it could be turned out on a flat plate without difficulty.

The Metallurgist in the Foundry

(*Continued from page* 128.)

TABLE VII.—*Tensile Tests on 12½ per cent. Manganese Steel at 1,150 °C.*

Per cent. P.	Tensile strength lb. per sq. in.	Elongation, per cent.
0.043	3,550	29.0
0.106	2,900	6.0
0.210	1,350	2.5
0.280	1,000	2.5

Conclusion

The Author has shown how metallurgists have co-operated with moulders working in different metals to prevent gasholes and hot tears and to improve the surface appearance of castings.

In conclusion, the Author wishes to acknowledge the encouragement and assistance given by the directors of Hadfields, Limited, in preparing this Paper, and gives thanks to the Institute of British Foundrymen and Mr. Frank Whitehouse for the loan of illustrations, and to the members of the Institute who took part in the discussion at Middlesbrough, Lincoln and Ipswich.

New Catalogues

Electric Motors.—Higgs Motors, Limited, of Witton, Birmingham, 6, have used a 4½ in. by 3½ in. booklet, well bound in stiff black covers, to set out in considerable detail recommended methods for the installation and maintenance of electric motors and generators. The booklet runs to over one hundred pages and is pleasingly illustrated.

The picture on page 49, however, is badly captioned. It shows an improvised method of loading a motor on to a lorry—presumably at the works of a user. To be clear, the caption should be extended to read: "where mechanical handling facilities are not available" for a casual reader a wrong impression is given as to the loading facilities available at Witton.

The choice of format is sensible, for its small bulk allows of its being carried about in an overall pocket, or being kept in a drawer in those not too spacious offices usually provided for foremen. The contents are such as to make it worth the while of those of our readers whose work includes maintenance to write to the sales manager at Witton to ask for a copy to be sent along.

Mechanical Handling Equipment. This publication by the Marco Conveyor & Engineering Company, Limited, of Rowin Works, Leytonstone, London, E.11, is particularly noteworthy, as it stresses in no uncertain manner the newer concepts of foundry practice. Though by no means confined to the foundry industry, this well-presented brochure does devote much space and many illustrations to showing the great contribution this firm has made in the direction of the mechanised production of cast articles. Besides a 32-page section devoted to this subject, the reviewer found considerable interest in the general plant available for mechanical handling, for amongst this section is much capable of worthwhile application in operations ancillary to the mass production of castings. If there be a fault at all with this catalogue it is the meagre amount of letterpress. The publishers have relied almost entirely on a selection of most impressive photographs to create interest in the subject of mechanical handling and to establish confidence in the ability of the firm to see the job through from the drawing board to satisfactory working. Whilst this is rather an expensive catalogue to broadcast, it can be presumed that it is available to the higher executives of the industry on writing to Leytonstone.

Metal Powders. A four-page leaflet issued by Murex, Limited, of Rainham, Essex, lists some 20 metallic powders which they manufacture for use by welding rod makers. They must, however, come in quite usefully for other lines of business. This leaflet is well worth filing as it contains information not easy to come by just when one wants. It is available to our readers in English, French, or Spanish, on their writing to the publicity manager at Rainham.

House Organ

The Nickel Bulletin, Vol. 20, No. 12

The Mond Nickel Company have now published the 12th and last part of Vol. 20 of The Nickel Bulletin for 1947. This issue contains a subject index to the volume, in addition to many abstracts of interest. There is a wealth of material under the heading of "Heat- and Corrosion-Resisting Alloys," including references to the articles that appeared in the Metal Industry based on the Paper "The Problem of High Temperature Alloys for Gas Turbines," read before the Royal Aeronautical Society by Sir William T. Griffiths. The Nickel Bulletin is obtainable free of charge from The Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

Book Review

German Malleable Iron Foundries (with a note on the Schenck fatigue machines). Published on behalf of the British Intelligence Objectives Sub-Committee, by H.M. Stationery Office. Price 9s. net.

The reports covering German industrial activities vary from poor to excellent, and this one—B.I.O.S. 1554—enters the latter category. There is still one matter which requires clearing up, and that is more specific data as to the effectiveness of the paint used in the annealing pots at Gebruder, Fischer, and August Engels. The position as it now stands is: (1) the steel cans used are reported to give double the life of cast iron pots; (2) the operatives at Engels were non-committal as to the beneficial effect of the dressing used; (3) no technical staff at Fischer's was available for questioning; (4) French investigators have been reported as being favourably impressed. The printing of analyses does not help much for the materials appear to be fire-clays, but a note as to the source of supply, and whether the paint is a natural product or compounded, would have been more satisfactory. After all, the cost of pots is important, whilst the published data on the subject are still somewhat meagre.

The most important part of the Report is that dealing with gaseous annealing at the works of the Bergische Stahl Industrie of Remscheid. The continuous oven used has an output of 158 tons per month of pipe fittings, of which at the moment there is a dearth throughout the world. At the hottest zone, a temperature of 1,020 deg. C. is maintained, and a fuel consumption per ton of 11,000 cub. ft. of gas of 550 B.Th.U. per cub. ft. is reported. Labour costs have been virtually halved. This is no doubt due to the elimination of packing, discharging and sorting costs, whilst the reduction in the time of the overall process must also introduce economies. It is because of the potentialities which gaseous annealing holds that the reviewer strongly recommends the purchase of this Report by all those engaged in this section of the foundry industry.

V. C. F.

Mr. Morrison Calls for Industrial Initiative

Mr. Herbert Morrison, Lord President of the Council, speaking at the conclusion of a tour of Glasgow industrial estates, said to leaders of Scottish industry: "Be up to date. Be modern-minded. Be willing to use in your service the research and scientific organisation that the Government and industry in co-operation, are placing at your disposal." He said that the State was increasingly co-operating with industry and working out plans in conjunction with industrial leaders.

"Let none of the industrialists in Scotland or elsewhere in any way assume from this that it lessens the need for enterprise, initiative, drive and liveliness in industrial management," he continued. These qualities of the individual in modern industry were as necessary as ever and the purpose of this Government's scientific and other aids was not to help the individual to rest upon his oars or become a little sleepy. It was to help him at his job, remembering that he had a duty to the nation to make the best of himself and the economic enterprise in which he was engaged.

Demand for Oil-well Equipment

Mr. G. L. Hancock, general manager of the David Brown Foundries Company, Limited, speaking at a Press conference at Penistone, said that British engineering firms were likely this year to satisfy orders worth about £71,000,000 for machinery needed by British oil companies. By 1951, it was estimated, the Near East and Persian Gulf producing areas might be exporting more oil than the whole of Latin America, and it was tempting to speculate what all this development meant in terms of engines, power stations, pipelines, refineries and transports.

There remained, however, a gap between supply and demand for 1948, particularly in drilling equipment.

Work of B.E.A.M.A.'s Welding Division

At the annual luncheon of the electric welding division of the British Electrical and Allied Manufacturers' Association, Mr. J. I. Law-Brooks (Metropolitan-Vickers Electrical Company, Limited), who presided, spoke of some of the activities of the welding division during the past year, mentioning the classification of arc-welding electrodes, produced in conjunction with the Institute of Welding, which had been accepted as a major contribution towards the development of arc welding. He said that the preliminary work in the formation of an international institute of welding had been accomplished.

Zinc Prices Increased

Under the Control of Non-ferrous Metals (No. 31) (Copper, Lead and Zinc) Order, 1948 (S.I.121 of 1948), which came into force on Friday, the maximum prices of zinc and zinc sheets are increased by £5 a ton and of zinc oxide by £4 5s. a ton. The Ministry of Supply states that the increased prices follow the recent rise in the American market price which affects the Ministry's buying prices for overseas supplies of zinc metal.

The Directorate of Non-ferrous Metals has resumed, as from Friday last, the granting of licences for the acquisition of unwrought zinc.

B.I.F. Facilities for Foreign Buyers

Among the facilities to be provided for foreign guests to the British Industries Fair, which opens simultaneously in London and Birmingham on May 3, is a special corps of interpreters which will be available at all three Fair buildings. In addition, catalogues of the London and Birmingham sections, which will be sectionalised and cross-indexed in the fullest possible detail, will be indexed in nine languages.

Home Consumption of Finished Steel

The accompanying table, based on official figures, shows the production, consumption and disposal of steel in the United Kingdom in recent years, with estimates for 1948. The figures are in thousands of tons.

Year. (1)	Home production of ingots and castings. (2)	Imports of ingots and semis (ingot equiv.). (3)	Exports of ingots and semis (I.E.). (4)	Ingots available for finishing in U.K. (2 + 3 − 4). (5)	Finished equivalent of 5. (6)	Imports of finished. (7)	Exports of finished. (8)	Home consumption of finished. (9)
1935	9,859	422	23	10,258	7,694	575	1,761	6,508
1936	11,785	637	17	12,405	9,304	510	1,660	8,154
1937	12,984	709	35	13,658	10,244	580	1,939	8,885 } 7,677
1938	10,398	426	25	10,799	8,099	447	1,384	7,162
1939	13,221	951	12	14,160	10,620	491	1,175	9,936
1940	12,975	2,306	12	15,269	11,452	805	853	11,404
1941	12,312	2,653	1	14,964	10,565	754	364	10,955
1942	12,942	1,863	2	14,803	10,451	472	181	10,742
1943	13,031	1,661	3	14,689	10,370	835	80	11,125
1944	12,142	1,100	1	13,241	9,481	394	164	9,711
1945	11,824	128	2	11,950	8,664	32	477	8,219
1946	12,695	429	5	13,119	9,511	45	1,672	7,884
1947	12,500	407	4	12,903	9,355	66	1,269	8,152
1948	14,000	530	—	14,530	10,520	126	1,000	9,646

Personal

MR. ARTHUR JENKINS has been appointed sales manager of the steel division of the Steel Company of Wales, Limited.

MR. A. S. DUNCAN has been appointed manager of the Doncaster works of Crompton Parkinson, Limited, manufacturing electrical engineers.

MR. S. T. MATTHEWS, MR. W. C. BELL and MR. P. J. L. ATTWOOD have been appointed directors of Hoover, Limited, Greenford, Middx.

MR. J. M. SURRALL, general commercial manager of the Simplex Electric Company, Limited, of Oldbury, has been elected to the board of the company.

MR. GEORGE LEESE, managing director of the Manor Engineering Company, Limited, Fenton, has been appointed a Justice of the Peace for Stoke-on-Trent.

MR. CARL J. BARBEE has been appointed general manager of Kelvinator, Limited, manufacturers of refrigeration and air-conditioning plant, of London, W.C.1.

MR. RALPH BENNETT, managing director, has been appointed chairman of Smethwick Drop Forgings, Limited, in succession to the late Mr. Edward Knight Gratwick.

MRS. D. RUSSELL, who has been adopted as a prospective Conservative Parliamentary candidate for Derby, is welfare officer to the Bentley Engineering Company, Limited, Leicester.

MR. R. C. THOMPSON, joint managing director of Joseph L. Thompson & Sons, Limited, shipbuilders, of Sunderland, has been elected to the River Wear Commissioners in succession to his father, SIR NORMAN THOMPSON.

MR. A. J. CADDICK has been elected assistant general secretary of the Amalgamated Engineering Union. He is a well-known trade unionist, and he has continuously held branch, district, or national office in the A.E.U. for 38 years.

MR. LEONARD HARPER, a director since 1938 and London manager for 23 years of Horseley Bridge & Thomas Piggott, Limited, constructional engineers, ironfounders, etc., of Tipton, has retired. He had been in the service of the company for 43 years.

MR. BERTRAM NELSON, a member of the Council of the Association of British Chambers of Commerce, has been appointed a member of the General Consultative Committee set up by the President of the Board of Trade to assist the Board on matters arising in administration of the Companies Acts.

MR. L. G. HARRIS, rolling-mill manager of Bayliss, Jones & Bayliss, Limited, Wolverhampton, for 24 years, has retired. He is a well-known figure in the West Midlands iron and steel trade. Mr. Harris represented the company in the South Staffs Iron and Steel Association and on the Midland Iron and Steel Wages Board.

PROF. M. L. E. OLIPHANT, F.R.S., has been awarded the Faraday Medal by the Council of the Institution of Electrical Engineers in recognition of his distinguished work in nuclear physics and his original discoveries in the physical sciences, particularly in the realm of electromagnetic oscillations, their production, study and use.

MR. D. P. C. NEAVE, managing director of Imperial Smelting Corporation, Limited, left for Australia on Tuesday. His journey is in fulfilment of the policy of the Zinc Corporation, Limited, New Broken Hill Consolidated and the Imperial Smelting Corporation for joint action in the development of industries in Australia.

MR. W. G. ARDLEY, a joint managing director of George Kent, Limited, has been re-elected as chairman for the third year in succession of the British Industrial Measuring and Control Apparatus Manufacturers' Association. MR. H. W. BLAKE, a director of Tylors (Water & Sanitary), Limited, has been elected deputy-chairman.

MR. W. LOVE has been appointed to cover the foundry supply interests of the Harborough Construction Company, Limited, Market Harborough, Leics, in the Edinburgh, Falkirk and East Coast of Scotland areas. MR. W. M. WILSON will continue to represent the company in the Glasgow and South-West of Scotland areas.

MR. J. SPENCE, foreman patternmakers with Western Foundries, Southall, a subsidiary of Le Grand, Sutcliff & Gell, Limited, has been presented with a suitably engraved gold watch by Mr. H. M. Gell, managing director Mr. Spence, who is 67 years of age, commenced employment with Western Foundries in 1910 and, apart from a break of some two years' service with the Admiralty, has been with them ever since. MR. W. TORRINGTON, 55-year-old charge-hand brass moulder, who joined the company in 1912, received a stainless-steel watch.

Wills

FURNELL, J. J., of Malvern, scrap metal merchant	£5,147
CREWE, H. T., of Bath, retired mechanical engineer	£13,609
FISHER, G. F., a director of Manchester Dry Docks Company, Limited	£66,132
FREW, WILLIAM, of Kilsyth, Stirlingshire, retired wire rope manufacturer	£11,087
LEEDHAM, AIR-COMM. HUGH, managing director of Ericsson Telephones, Limited, Beeston, Notts ...	£6,622
SOUTHWORTH, ALBERT, chief engineer of the Witton Works of the General Electric Company, Limited	£2,470
SALMON, DR. E. H., sole partner of Clark & Standfield, floating dock engineers, of Victoria Street, London, S.W.1	£59,505
HILL, C. M., partner of C. M. Hill & Company, steel merchants, engineers and agents, of Kingston-on-Thames	£13,211
POOLEY, A. M., a former general and works manager of the fuse-gear section of the English Electric Company, Limited, Stafford	£7,843
NEWBUM, SIR C. H., late chairman of Shipley & Company, Limited, iron, steel and metal stockholders, of Lincoln, and a director of Rotherham Forge & Rolling Mills Company, Limited ...	£60,539
DYSON, WILLIAM, chairman and managing director of the British Railway Traffic & Electric Company, Limited, chairman of Owen & Dyson, Limited, wheel and axle manufacturers, of Rotherham, and a director of the British Wagon Company, Limited	£108,525

Obituary

MR. ROBERT LOW SMITH, for many years chief metallurgist of Vickers-Armstrongs, Limited, has died at the age of 62.

MR. JAMES STEIN, who died on January 21, was for 55 years with the Singer Manufacturing Company, Limited, Clydebank, Glasgow.

MR. JOHN PEDEN THOMSON, late cashier of Sir William Arroi & Company, Limited, bridge builders, etc., of Glasgow, died on January 22.

MR. WILLIAM MITCHELL BIGGART, chairman of Watson & McLean, Limited, chain makers and electric welders, of Govan, Glasgow, died on January 22.

MR. WILLIAM SMITH, stage inspector for the Middle Docks & Engineering Company, Limited, South Shields, has died at the age of 60. He had been with the company for 30 years.

MR. A. M. NISBETT, formerly Tyneside sales representative of the British Oxygen Company, Limited, has died at Jarrow. He was with the company for 21 years and retired in 1942.

MR. JAMES COLVILLE, a director of the Clyde Alloy Steel Company, Limited, died last month, aged 54. He joined the staff of the company in 1921 and was appointed a director in 1936.

MR. ALEXANDER MACGREGOR, a partner in the firm of P. & R. Fleming & Company, iron stockholders, manufacturers of girders, agricultural implements, etc., of Glasgow, died recently.

MR. CHARLES PERCY CLARKE, who was the proprietor of James Clarke & Sons, Limited, metal-mount and chromium-plate manufacturers, of Cobridge, died recently, at the age of 67. He had been in failing health for some years.

MR. HARRY BAKER died in a Birmingham nursing home, after a short illness, on January 22, at the age of 79. He was secretary of the Midland area of the National Union of Manufacturers for 29 years. Mr. Baker had been active up to a few days before his death.

MR. JOHN MUIRHEAD, the well-known shipbuilder, died recently at Greenock, at the age of 72. He was a director of Lithgows, Limited, Port Glasgow, and had been associated with the company for over 40 years. He retired from active work a year ago, but retained his seat on the board of directors.

ENG.-CMDR. D. HASTIE SMITH, R.N. (ret.), who has died in London after an operation, was, for the past 10 years, the author of the monthly "Shipbuilding and Marine Engineering Abstracts," published jointly by the Institute of Marine Engineers and the Institution of Naval Architects. He was also a member of the Papers and Transactions Committee of the Institute of Marine Engineers.

WORK HAS STARTED on the erection of a factory for Reay Gearworks, Limited, Gateshead, on the site of the old Newcastle shipyard, Hebburn-on-Tyne.

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Marsh & Young, Railway Foundry, Capron Road, Dunstable—Ironfounders, etc. £3,000.

Kipp Castings, 98, Cherry Orchard Road, Croydon—£1,000. R. G. Hollands and L. W. Blair.

Galibier Engineering Company, Croindene, Summerley, Felpham, Sussex—£1,000. L. Potter.

J. Beet, The Arches, Oak Street, Sheffield—Constructional engineers, etc. £2,000. J. and D. Beet.

Die Casting Tool & Engineering Company (Southgate), 34, Station Road, Southgate, Mdx—£2,000.

Precision Products (Cumberland), High Mill, Alston, Cumberland—£6,000. W. G. Ball and I. P. Woodhead.

Chrome Production (Southern), Newtower Road Continuation, Hove—£8,750. J. F. H. Jay and G. P. H. Noble.

Brytallium Castings (Bolton), 26, Brazennose Street, Manchester—£35,000. H. Harwood, J. Turner, and J. Wright.

T. Norris (Metal Merchants), 527, Grand Buildings, Trafalgar Square, London, W.C.2—£3,000. T. and L. E. Norris.

British North Europe (Engineering)—£10,000. C. M. O'Kelly, 63, Hamilton Terrace, St. Johns Wood, London, N.W.8.

United Kingdom Construction & Engineering Company, Midland Bank Building, Spring Gardens, Manchester—£100,000.

John Davidson & Sons (Engineers), 51-53, High Street, Turriff, Aberdeenshire—£5,000. J., D. A., J. A., and A. Davidson.

Sowerbutts & Watson (1947), Union Works, Cotton Street, Accrington—Mechanical engineers. £7,000. L. and F. K. Birtwistle.

Farmtrac Engineering Company, Beehive Lane Works, Beehive Lane, Chelmsford—£1,300. T. Gledstone and A. J. Bannister.

Cornish Tin-mining Potentialities

Addressing the Winter Festival of Old Cornwall Societies at Falmouth, Mr. W. Tregonning Hooper said that 10,000 tons of tin a year could still be produced in Cornwall. The best-informed authorities were emphatic that there was as much mineral left in Cornwall as had been produced there through the ages, he said. Mining was now practically extinct in the county, but tin was worth £540 a ton. He said he would like to see Cornwall united in an appeal for a commission to be appointed by the Government to carry out an exhaustive research into the whole question. The American demand for base metals was enormous, and the complete restoration of Cornish mining would greatly help to bridge the dollar gap.

News in Brief

WM. PICKERSGILL & SONS, LIMITED, Sunderland, are to launch the Nefertiti, the first ship built on the Wear for Egyptian owners, on Tuesday next.

HARLAND & WOLFF, LIMITED, Belfast, have received an order from Shaw Savill & Albion Company, Limited, for two 13,000-ton cargo ships.

AN ORDER for a motor tanker of 16,000 tons d.w. has been received by Charles Connell & Company, Limited, Scotstoun, Glasgow, from Bergen owners.

THE BLYTH SHIPBUILDING & DRY DOCK COMPANY, LIMITED, which has been carrying out an extensive modernisation scheme, can now build ships up to 20,000 tons.

THE GOVERNMENT'S DECISION, announced recently, to dispose of certain capital ships in the Royal Navy, will, it is expected, make available about 82,000 tons of scrap metal.

PLANS HAVE BEEN APPROVED for the erection of a large factory on the site of the former Cadzow Colliery, Hamilton, for MacLean & Company (Metal Windows), Limited, Glasgow.

CRITTALL-HOPE METAL WINDOWS (SOUTH AFRICA), LIMITED, is making an issue in Johannesburg of 300,000 ordinary 5s. shares at 14s. each to finance a new factory at Port Elizabeth and additional machinery at Johannesburg.

THE ALUMINIUM PLANT & VESSEL COMPANY, LIMITED, is taking steps to change its name to the "A.P.V. Company," and to increase borrowing powers from £475,000 to £650,000, which will cover borrowings by subsidiaries.

THE HEAD OFFICE of Stein & Atkinson, Limited, combustion engineers and furnace constructors, will be at Parnell House, 25, Wilton Road, London, S.W.1, as from February 16. The telephone number will be Victoria 4661 (6 lines).

RICHARDSONS WESTGARTH & COMPANY, LIMITED, Hartlepool, have completed a large condenser for Leicester Corporation power station. A second condenser is being completed, while turbines and an alternator will be completed for the same power station within a few weeks.

THE DECISION OF Bradford Town Planning Committee to lease to Crofts (Engineers), Limited, Thornbury, Bradford, a piece of land adjoining the works, will subsequently lead to more employment and production. A store will be built on the land and workshop space extended and rearranged.

THE PARLIAMENTARY SECRETARY of the Board of Trade, Mr. J. W. Belcher, is to be asked by the Borough M.P.s to receive a deputation from Sunderland Town Council to discuss the future of the site of the yard of the Shipbuilding Corporation, Limited, which was closed last summer.

DUALLOYS (1947), LIMITED, Chard, Som, have changed their name to Dualloys, Limited. On November 6, 1947, 100,000 shares were allotted as consideration for the purchase of the undertaking and assets of Dualloys, Limited (incorporated in June, 1935). Sterling Industries, Limited, were the allottees.

AN OFFER TO CREATE an endowment fund for helping workers in the chainmaking industry, who, through ill-health, accident or other misfortunes, are reduced to actual distress, has been made by Mr. Henry Woodhouse, president of Cradley Heath Chain Manufacturers' Association and head of Samuel Woodhouse & Sons, Cradley Heath.

THE NORTHERN IRELAND Ministry of Commerce has set up a Council of Scientific Research and Development, with Sir David Lindsay Keir as chairman of the Council. Other members include Mr. O. F. Brown (Department of Scientific and Industrial Research), Mr. D. Rebbeck (Harland & Wolff, Limited), and Mr. D. E. Wiseman (Short & Harland, Limited).

MR. E. W. F. HALL-CRAGGS has acquired the entire interests in the business of Gascoignes Non-ferrous Foundries, Limited, 405, Montrose Avenue, Trading Estate, Slough, Bucks, of which concern he has been hitherto the managing director. He has now become, in addition, chairman of the company. The other directors are Mrs. A. S. Hall-Craggs and Mr. J. F. Cullingham.

BROOM & WADE, LIMITED, manufacturers of air compressors and pneumatic tools, of High Wycombe, are to issue, subject to Treasury consent, 269,000 new 5s. ordinary shares of which 243,666 will be offered to ordinary-stock holders in the proportion of one for every three held, leaving 25,334 shares which, together with any of the 243,666 not taken up, it is proposed to sell in the market.

A DECISION BY the Mersey Association of the Shipbuilding Employers' Federation to abolish payment by results from March 29, means that 20,000 ship-repair workers on Merseyside will suffer a drop in wages estimated at between 6d. and 1s. an hour. The bonus scheme was first operated during the war and ended in 1945. It was reintroduced between August and December last year by individual agreements.

AERO RESEARCH, LIMITED, which has for some years held the rights of manufacture from Ciba, Limited, of melamine formaldehyde resins for adhesives and the like, has now concluded arrangements with Ciba, Limited, covering a number of novel plastics, including melamine formaldehyde resins for textiles, wet strength paper, and other applications, as well as the new metal-to-metal adhesive and casting resin known as "Araldite."

FOUR HUNDRED EMPLOYEES of the Motherwell Bridge & Engineering Company, Limited, have decided to accept an offer by the company of a local production bonus. The bonus, which is one of 5s. 9d. weekly for unskilled and semi-skilled and 7s. 5d. weekly for skilled workers, is to be given a three-month trial, and is not to be affected by any national wage increase which may be granted. The employees held a one-day strike recently in support of their bonus claim.

Gazette

TUNGSIT ELECTRO-METAL WORKS, LIMITED, is being wound up voluntarily. Mr. H. C. E. Miller is the liquidator.

WATTS (ENGINEERS), LIMITED, is being wound up voluntarily. Mr. J. Lewin, 28, Maddox Street, London, W.1, is the liquidator.

STANNUM, LIMITED, is being wound up voluntarily. Mr. R. A. Masters, 27, Martin Lane, Cannon Street, London, E.C.4, is the liquidator.

METAL PRESSING DIE DESIGN, LIMITED, is being wound up voluntarily. Mr. A. G. White, 73, Cheapside, London, E.C.2, is the liquidator.

GROSVENOR ENGINEERING COMPANY, LIMITED, is being wound up voluntarily. Mr. J. B. Yearsley, 27, Brazennose Street, Manchester, is the liquidator.

EDISON SWAN CABLES, LIMITED, is being wound up voluntarily. Mr. D. Q. Holland, Crown House, Aldwych, London, W.C.2, is the liquidator.

C. FIRBANK (METAL MERCHANTS), LIMITED, is being wound up voluntarily. Mr. D. R. Henderson, 167-170, Fleet Street, London, E.C.4, is the liquidator.

ROTHSCHILD METALS, LIMITED, is being wound up voluntarily. Mr. R. A. Masters, 27, Martin Lane, Cannon Street, London, E.C.4, is the liquidator.

MICRO-LEAD PRODUCTS (ERICSSON), LIMITED, is being wound up voluntarily. Mr. W. E. Carnelley, 14, George Street, Mansion House, London, E.C.4, is the liquidator.

THE YORKSHIRE RANGE & MANTEL COMPANY, LIMITED, is being wound up voluntarily. Mr. B. E. Collins, West War Chambers, 28, Boar Lane, Leeds, is the liquidator.

HEATLY GRESHAM ENGINEERING COMPANY, LIMITED, is being wound up voluntarily. Mr. A. Rigby, Midland Bank Buildings, Spring Gardens, Manchester, is the liquidator.

COSWAY (SALES), LIMITED, electrical engineers, etc., of Dudley, is being wound up voluntarily. Mr. W. L. Jenner, Millmarsh Lane, Brimsdown, Enfield, is the liquidator.

MR. A. W. HUNTER (with a Committee of Inspection), 185-188, High Holborn, London, W.C.1, has been appointed liquidator of Sunbury Cross Engineers, Limited, and of Trailer Chassis, Limited.

A. D. KEELING & COMPANY, LIMITED, metal manufacturers and scrap-metal merchants, of Birmingham, is being wound up voluntarily. Mr. R. W. Rutledge, 131, Edmund Street, Birmingham, is the liquidator.

THE PARTNERSHIP BETWEEN Florence Bessie Hunt and Alfred Edward Styles, carrying on business as general metal workers at Downton, Wilts, under the style of Downton Metalcraft Company, has been dissolved.

THE PARTNERSHIP BETWEEN Arthur Bradley, Thomas William Allen, and John Edward Bradley, carrying on business as aluminium founders at Great Bridge Street, West Bromwich, under the style of Great Bridge Casting Company (Aluminium Founders), has been dissolved. Debts will be received and paid by A. Bradley and T. W. Allen, who continue.

BRITISH ELECTRONIC PRODUCTS, LIMITED, is being wound up voluntarily. Mr. J. A. Stokes, 28, Honor Avenue, Goldthorn Park, Wolverhampton, is the liquidator. He has been empowered to carry into effect the agreement entered into with British Electronic Products (1948), Limited, in the terms of the draft submitted to the shareholders and agreed to by them.

New Trade Marks

The following applications to register trade marks appear in the "Trade Marks Journal":—

"JAGUAR"—Hollow-ware. BRETTELL (HARDWARE), LIMITED, Providence Works, Hingley Street, Old Hill, Staffs.

TRIDENT DEVICE—Rotary pumps, etc. SIGMUND PUMPS (GREAT BRITAIN), LIMITED, Team Valley Estate, Gateshead.

"OPTIDYNE"—Transmission gear, internal-combustion engines, etc. DYNOWORKS, LIMITED, 89, Woodstock Road, Oxford.

"PYRAMID"—Machines for sealing packages. A. H. BLAND (ENGINEERS), LIMITED, West End, Yeading Lane, Northolt, Mdx.

"VECO"—Air, oil and water filters, etc. VERNON ENGINEERING COMPANY, 333, Tower Building, Water Street, Liverpool.

"GARRIRAK"—Metal storage racks. NEWTON, SHAKESPEARE & COMPANY, LIMITED, Garrison Works, Garrison Lane, Birmingham.

"OMPACT" and "COMP"—Pumps, compressors, etc. COMPACT COMPRESSOR COMPANY, LIMITED, 174, Edmund Street, Birmingham.

"B.I."—Insulated electric cables, etc. BRITISH INSULATED CALLENDER'S CABLES, LIMITED, 103, Mount Street, London, W.1.

"UNI" (DEVICE)—Abrasive products, etc. UNIVERSAL GRINDING WHEEL COMPANY, LIMITED, Universal Works, Doxey Road, Stafford.

"UNIRUNDUM"—Grindstones (machines). UNIVERSAL GRINDING WHEEL COMPANY, LIMITED, Universal Works, Doxey Road, Stafford.

"ARENCO"—Milling machines, lathes, etc. ARENCO AKTIEBOLAG, c/o Boult, Wade & Tennant, 112, Hatton Garden, London, E.C.1.

"FLUOTROL"—Transformers, insulated electric wire, etc. F. C. HEAYBERD & COMPANY, LIMITED, 28, Russell Square, London, W.C.1.

"VORTELEX" and "VORTICE"—Mixing machines. E. HUNT & COMPANY, LIMITED, Mellish Iron Works, Ripple Road, Barking, Essex.

"BOFEC"—Building materials, chains, pipes, etc. BRITISH OILFIELD EQUIPMENT COMPANY, LIMITED, 28, Victoria Street, London, S.W.1.

"TRIPOD PRODUCT" (DEVICE)—Metal hurdles, fencing, etc. TRIPOD ENGINEERING COMPANY, LIMITED, 31, Alcombe Road, Minehead, Som.

THE MODERN PIG

IF YOU WANT...
clean iron, free from sand, free from sows ...uniform analysis... convenient size...easy handling... specify STANTON MACHINE CAST PIG IRON

SPECIFICATION

WEIGHT	80-90 lbs.
Length	22 inches
Width	8½ inches
Thickness	3¾ inches

(at notch 2½ inches).

Made in our well-known

STANTON, HOLWELL & RIXONS BRANDS

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

Contracts Open

Any date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Barking, February 25—Manhole covers and frames, gully grates, etc., for the Borough Council. The Borough Engineer and Surveyor, Town Hall, Barking, Essex.

Bath, February 11—Provision and laying of spun-iron water mains, for the City Council. The City and Waterworks Engineer, Guildhall, Bath. (Fee £2 2s., returnable.)

Blackpool, February 16—Supply of manganese steel points and crossings, for the Borough Council. The Borough Surveyor, Municipal Buildings, Blackpool.

Bradford, February 16—(*a*) Supply and erection of a 24-in. dia overhead steel main, etc., and (*b*) supply of 18-in. and 24-in. dia. cast-iron pipes and specials, for the Town Council. The Engineer and Manager, Britannia House, Bradford.

Cork, March 1—Supply of 5,000 yds. of 4-in. and 1,000 yds. of 6-in. cast-iron water main, in 12-ft. lengths, for the Town Council. Mr. P. Monahan, city manager and town clerk, City Hall, Cork.

Eccles, February 14—Manhole and lampeye covers, frames, gully grates and frames, etc., for the Borough Council. The Borough Surveyor, Town Hall, Eccles.

Evesham, February 28—Construction of 1,200 yds. of 6-in. cast-iron gas mains, and 200 yds. of steel gas mains, etc., for the Borough Council. The Borough Surveyor, Municipal Offices, Evesham. (Fee £3 3s., returnable.)

Halifax, February 28—Tools, castings, etc., for the Borough Council. Mr. G. Holden, borough engineer, Crossley Street, Halifax.

Huddersfield, February 20—Cast iron, for the Corporation. The Borough Engineer and Surveyor, High Street Buildings, Huddersfield.

Ilford, February 16—Iron castings, engineers' sundries, iron, nails, screws, etc., for the Corporation. Mr. L. E. J. Reynolds, borough engineer and surveyor, Town Hall, Ilford.

Loddon, February 21—Providing and laying of approx. 285 yds. of 9-in. dia. stoneware pipe sewer and 100 yds. of 4-in. dia. spun-iron sludge pipe, etc., for the Rural District Council. W. Herbert Bateman & Partners, consulting civil engineers, Halifax House, Bank Plain, Norwich. (Fee £3 3s., returnable.)

London, S.E., Febuary 16—Iron tyres, for the Metropolitan Borough of Bermondsey. Mr. S. E. Freeman, town clerk, Town Clerk's Office, Bermondsey, London, S.E.16.

Newcastle-under-Lyme, February 13—Castings, etc., for the Borough Council. The Borough Surveyor, Lancaster Building, Newcastle, Staffs.

Stockport, February 21—Steel fabric for road reinforcement, iron castings, etc., for the Borough Council. Mr. W. F. Gardner, borough surveyor, Town Hall, Stockport.

Turton, February 24—Cast-iron gulley grates and manhole covers, etc., for the Urban District Council. Mr. R. Dart, engineer and surveyor, Council Offices, Bromley Cross, near Bolton.

Twickenham, February 21—Iron castings, etc., for the Corporation. Mr. A. S. Knolles, borough engineer and surveyor, Municipal Offices, Twickenham.

York, February 23—Contract No. 9, construction of twin spun-iron sewage rising mains, 14-in. and 21-in. dia. Contract No. 10, construction of three spun-iron sewage rising mains, one 14-in. and two 21-in. dia., for the Corporation. Mr. C. J. Minter, city engineer and architect, Guildhall, York.

Company News

(Figures for previous year in brackets.)

Charles Carr—Interim dividend of 60% (50%).

Clyde Crane & Booth—Dividend of 25% (20%).

Metropolitan Gas Meters—Dividend of 15% (same).

Greenwood & Batley—Interim dividend of 5% (same).

Baldwins (Holdings)—Interim dividend of 5% (same).

M. Mole & Son—Final dividend of 20% (15%) and bonus of 5% (same), making 25% (20%).

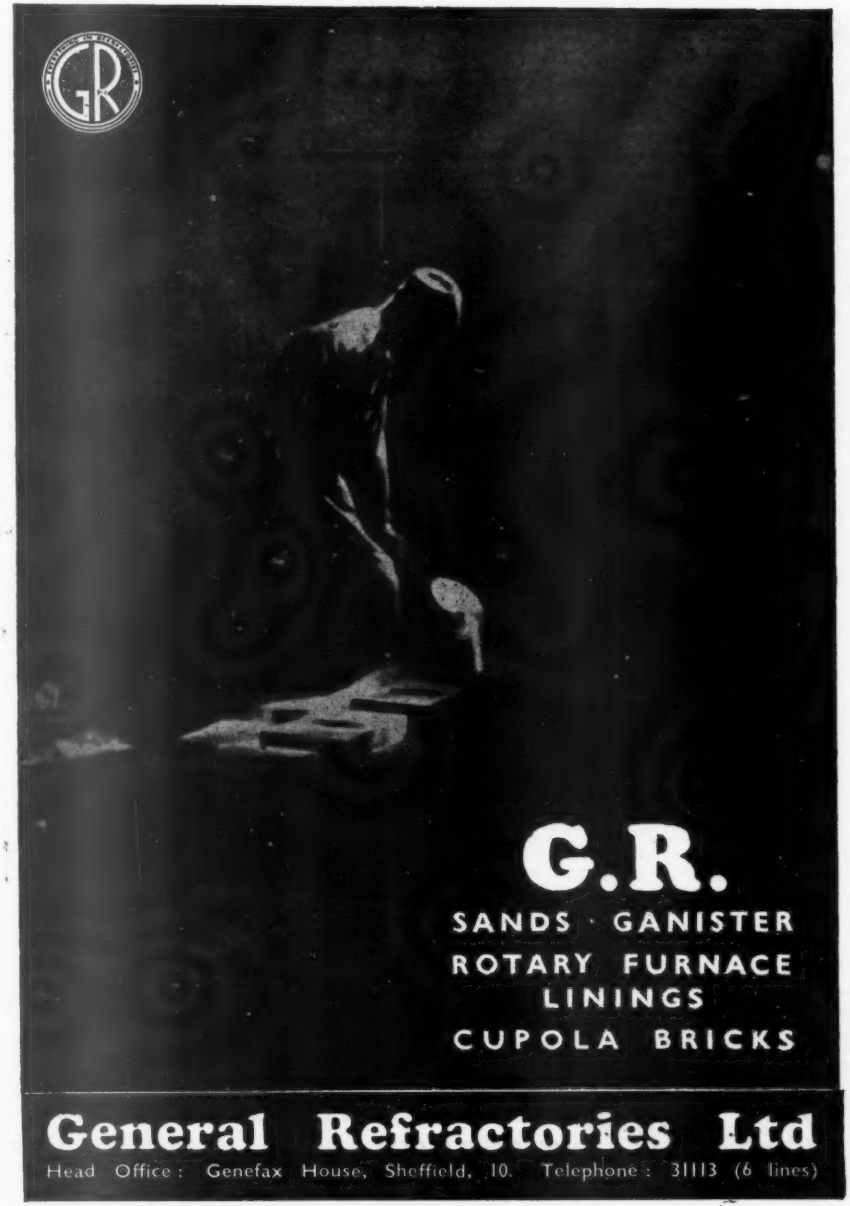
Aberdare Cables of South Africa—Net profit from August 13, 1946, to June 30, 1947, after administration and depreciation, £12,777; interest on investments, £2,770; to tax, £4,000; dividend of 2½%; forward, £475.

Consett Iron Company—Interim dividend of 5% (2½%). The directors state that the object of the increased payment is to even out the year's distribution and is not an indication that the total for the year will be increased.

Broom & Wade—Trading profit for the year ended September 30, 1947, £367,552 (£247,811); dividend received from Australian subsidiary, £194 (nil); to depreciation, £37,286 (£27,908); pension fund, £10,000 (£20,000); net profit, £320,460 (£199,903); final dividend of 15%, making 22½% (same); tax, £206,747 (£148,535); reserve, £50,000 (£20,000); forward, £80,033 (£42,730).

Parsons Engineering Company—Trading profit to October 31, after all working expenses, £10,609 (£13,122); surplus on realisation of investment, £75 (£425); to directors' fees, £550 (£264); debenture interest, nil (£381); depreciation, £663 (£619); net profit, £9,471 (£12,293); to taxation, £2,500 (£7,550); increase of capital expenses, nil (£132); dividend of 25% (same); forward, £4,971 (£2,818).

Samuel Marsden & Son—Trading profit to July 31, £20,949 (£8,943); other income, £123 (£2,901, including £2,874 transferred from insurance fund); to taxation, £190 (nil); depreciation, £5,495 (£5,747); debenture interest, £1,700 (same); directors' fees, £458 (£438); net profit, £13,229 (£3,959); dividend on preference shares two and a half years to June 30, 1943 (one year); provision for redundant machinery, £5,000 (nil); partial forward reserve for income tax, £2,500 (nil); special depreciation, £7,521 (nil); forward, £16,716 (£21,760).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Raw Material Markets

Iron and Steel

Foundries are in a reasonably good position in respect to cupola coke; allocated tonnages are sufficient for current needs, although no margin is left for stocking. The position in regard to supplies of pig-iron and scrap is anything but satisfactory and, with prior consideration being given to the production of basic iron for the steel industry, improvement is unlikely. This is unfortunate, as both light foundries and the general engineering and jobbing works have plenty of work on hand which would warrant maximum outputs if the raw materials were available. There is a particular stringency in high-phosphorus iron, which is produced largely in the Northamptonshire and Derbyshire furnaces and which is almost exclusively used by the light-foundry industry. Supplies of low- and medium-phosphorus, hematite, and refined irons are in strong request by the engineering and speciality foundries and it is not always easy to get even licensed quantities.

Re-rollers could do with more semis, and there is a particular dearth in 2-in. to 3-in. billets for the rollers of small sections, the lighter gauges and widths of strip, and small steel bars. There have been improvements recently in supplies of heavy billets, blooms, and wide slabs, which have helped some of the re-rollers to a considerable extent; but outputs have suffered through the absence of adequate supplies of semis and, unless the Control can secure larger quantities of imported material, this position will remain, as it is quite impossible for home makers to increase outputs to meet the total demand. Some re-rollers are getting small supplies of electrically-melted steel, and all users are eager to get defective billets or sheet bars and crops to eke out the primes, which are in short supply.

Makers of steel plates and sections are working to capacity to meet the demand for supplies of joists, sections and plates; users are anxious to get all the steel possible during this period and steelworks are pressed for supplies. The new authorisation scheme should be much easier for the mills to operate and, in the long run, will be better for the consumers. The P.M.L. classes are getting a fairly big proportion of present outputs and the National Coal Board, coming within this category, is receiving substantial tonnages of steel in the form of arches, roofing bars, props, etc.

Non-ferrous Metals

All doubts regarding the new level of the zinc quotation were resolved last Friday when the Ministry of Supply announced that it was once again prepared to grant licences for the acquisition of the metal on the basis of £75 per ton for common metal and £75 15s. for high-grade zinc. The advance of £5 per ton was certainly less than had been expected, and, while in some directions there may have been a sense of disappointment that brass values would not, after all, climb very far as a result of the adjustment, most traders were relieved that the sterling quotation had resisted to some extent the upward thrust of the American market. Trading can now settle down again, but the Ministry's action in withdrawing the granting of licences has given the trade rather a jolt and served to disturb still further confidence in the future, which was already somewhat undermined through fears that a recession in activity is likely in the near future. Actually, regarding this recession, there are no facts to support the belief, but, nevertheless, there is a measure of uneasiness and a growing disposition to buy for near rather than for far dates. In any case, export business is not what it was, and in due course it may well be that we shall price ourselves out of these markets owing to our high costs of production.

The demand for scrap appears to have eased somewhat, due perhaps to the fact that prices are extremely high and sellers are not in the mood to consider any reductions. There are some fairly big tenders awaiting settlement, and it is understood that the Ministry of Supply is likely to offer further quantities before long. Even so, one cannot imagine that the position in secondary metals is going to ease greatly, for stock reservoirs seem to have been depleted and quantities available are not large. December saw some rather heavy buying by users, and it is probable that a good many are in a position to sit back for a time and watch events. If this course is pursued to any extent, then prices may very well decrease, for merchants are not eager to hold large stocks at the ruling levels. There have been further reports of a possible rise in the copper price, but this does not seem likely, for 21½ cents per lb. is a level which should be very satisfactory to producers, and, in the United States, price expansion is certainly unpopular. On the world market, good prices are being paid for such sterling copper as is available.

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